

REMARKS/ARGUMENTS

Claims 66, 68-73, 75-94 and 96-106 are pending herein. Claims 67, 74 and 95 have been cancelled without prejudice or disclaimer. The subject matters originally recited in cancelled claims 67, 74 and 95 have been added to claims 66, 73 and 94, respectively. Claim 94 has also been amended to recite that the infiltrating metal alloy has an initial coefficient of thermal conductivity of not less than 100 W/mK, as supported throughout the original specification. Claim 81 has been amended to recite that the element added to the infiltrating metal is Si. New claims 104-106 are added hereby, as supported by original claims 80 and 81.

Examiner Turner is thanked for courtesies extended to Applicants' representative (Steven Caldwell) during a telephonic interview on August 21, 2003. The substance of that interview has been incorporated into the following remarks.

1. Claims 66, 68 and 69-102 were rejected under §102(b) over Maruyama et al. To the extent that this rejection might be applied against amended claims 66, 73, 80, 87 and 94, and pending claim 101 (and all claims dependent therefrom), it is respectfully traversed.

Pending independent claim 66 recites, among other things, that a Cu, Al or Ag metal is infiltrated into a carbon or graphite porous sintered member. Pending claim 66 has been amended to clarify that the element added to the infiltrating metal to improve wettability between the porous sintered member and the metal is added prior to infiltration of the metal into the porous sintered member and is one or more of Te, Bi, Pb, Sn, Se, Li, Sb, Tl, Ca and Cd.

Pending independent claim 73 recites, among other things, that a Cu, Al or Ag metal is infiltrated into a carbon or graphite porous sintered member. Pending claim 73 has been amended to clarify that the element added to the infiltrating metal to improve reactivity with the porous sintered member is added prior to infiltration of the metal into the porous sintered member and is one or more of Nb, Cr, Zr, Be, Ti, Ta, V, B and Mn.

Pending independent claim 80 recites, among other things, that a Cu or Ag metal is infiltrated into a carbon or graphite porous sintered member. Pending claim 80 has been amended to clarify that the infiltrating metal includes Cu and Ag (Al has been omitted) and that the element added to the infiltrating metal to improve molten metal flow performance is added prior to infiltration of the metal into the porous sintered member.

Pending claim 87 recites, among other things, that a Cu, Al or Ag metal is infiltrated into a carbon or graphite porous sintered member. Claim 87 has been amended to clarify that the element added to the infiltrating metal to lower the melting point of the infiltrating metal is added to the metal prior to infiltration of the metal into the porous sintered member.

Pending independent claim 94 recites, among other things, that a Cu, Al or Ag metal is infiltrated into a carbon or graphite porous sintered member. Pending claim 94 has been amended to clarify that the element added to the infiltrating metal to improve a coefficient of thermal conductivity of the heat sink material is added to the metal prior to infiltration of the metal into the porous sintered member.

Pending claim 94 has been further amended to clarify that the element added to the infiltrating metal results in an alloy being deposited on the surface of the infiltrating metal after a heat treatment and reaction with the porous sintered member. The deposited alloy has an initial coefficient of thermal conductivity of not less than 100 W/mK.

Pending independent claim 101 recites, among other things, that a Cu, Al or Ag metal is infiltrated into a carbon or graphite porous sintered member to form a heat sink material. A carbide layer is formed on a surface of the carbon or graphite heat sink material. As is discussed in the specification (and recited in pending claim 102), the carbide layer is formed due to a reaction between the carbon or graphite porous sintered member and an element that is added to the infiltrating metal.

Maruyama discloses a copper-carbon composite material. Maruyama recognizes that Cu metal "does not have good wettability against carbon material" and attempts to resolve this poor wettability problem by adjusting the physical properties of the carbon material using a siliconization treatment prior to Cu metal impregnation into the carbon material pores (see column 5, lines 61-62). Maruyama also teaches that the carbon material (and not the infiltrating metal, as claimed) can be modified to include WC or TiC to form a composite material prior to Cu metal impregnation into the carbon material.

It is clear that Maruyama discloses only that the physical properties of the carbon material itself should be adjusted prior to Cu metal impregnation. There is not even a remote suggestion in Maruyama of changing the physical properties of the infiltrating metal itself at any time, let alone prior to being infiltrated into a porous sintered member, as claimed. This is evidenced by the fact that Maruyama merely discloses that the Cu metal can be a Cu alloy and does not disclose what other elements can be included in the Cu alloy. There is certainly no teaching in Maruyama that the infiltrating metal should include an additional element(s) to

advantageously improve wettability, reactivity, molten metal flow performance, metal melting point properties and coefficient of thermal conductivity properties, or to provide for the formation of a carbide layer on a surface of the carbon material, as recited in pending claims 66, 73, 80, 87, 94 and 101, respectively.

The following discussion provides two illustrative examples supporting the above points. Maruyama certainly does not disclose or suggest that a component part of the Cu alloy functions to improve wettability between the Cu alloy and the carbon material, as recited in pending claim 66. Indeed, Maruyama teaches that the periphery of the carbon material pores should undergo a siliconization treatment for this very purpose. As such, based on the Maruyama patent, skilled artisans would have had no reason to believe that a wettability-improving agent is included (or should be included) in Maruyama's Cu alloy in addition to the siliconization treatment already used on the carbon material.

Maruyama modifies the carbon material (again, not the infiltrating metal, as claimed) to include WC or TiC for the specific purpose of forming a composite material prior to Cu metal impregnation into the carbon material. There is no reason one would believe that W and Ti would necessarily disassociate from their counterparts C to mix with the impregnated Cu metal. Even if such a disassociation were to occur, Applicant's respectfully submit that the siliconization treatment would act as a barrier layer to prevent W and Ti from mixing with the impregnated Cu metal. Moreover, based on disclosure in Maruyama, there is also no reason one would believe that Si from the siliconization treatment would necessarily disassociate from its oxygen counterpart to mix with Maruyama's impregnated Cu metal. Consequently, Applicants respectfully submit that skilled artisans would be led to believe that the *chemical elements added to Maruyama's carbon material* would not mix with the Cu metal impregnating the siliconized pores of the carbon material.

In view of all of the foregoing, the PTO has simply failed to cite to any evidence in Maruyama showing that skilled artisans would recognize that certain elements are added to the impregnating metal for any reason, let alone to change the physical properties of the metal to provide the structures recited in pending claims 66, 73, 80, 81, 94 and 101. Reconsideration and withdrawal of the §102(b) rejection over Maruyama are respectfully requested.

2. Claims 66-87 and 89-103 were rejected under §102(b) over EP 0673900. To the extent that this rejection might be applied against amended claims 66, 73, 80, 87 and 94, and pending claim 101 (and all claims dependent therefrom), it is respectfully traversed.

EP '900 discloses a carbon/carbon composite having a metal alloy infiltrated therein. As discussed during the above-noted telephonic interview, EP '900 provides a laundry list of elements that can be included in the metal alloy for the purpose of raising the coefficient of thermal expansion of the carbon/carbon composite (see page 3, lines 19-26). As discussed above, pending independent claim 66 recites that a Cu, Al or Ag metal is infiltrated into a carbon or graphite porous sintered member. The infiltrating metal includes one or more of Te, Bi, Pb, Sn, Se, Li, Sb, Tl, Ca and Cd to improve wettability between the porous sintered member and the infiltrating metal. None of the wettability-improving materials now recited in pending claim 66 are shown in the laundry list of thermal expansion-improving elements appearing on page 3 of EP '900. Nor has the PTO cited to any factual evidence in EP '900 that would motivate skilled artisans to include any of the wettability-improving materials recited in pending claim 66 in the metal alloy disclosed in EP '900. There is simply no disclosure in EP '900 concerning the need to improve wettability between the infiltrating metal and composite material. Consequently, EP '900 fails to disclose or suggest each and every element recited in pending claim 66.

As discussed above, pending independent claim 73 recites that a Cu, Al or Ag metal is infiltrated into a carbon or graphite porous sintered member. The infiltrating metal includes one or more of Nb, Cr, Zr, Be, Ti, Ta, V, B and Mn to improve reactivity with the porous sintered member. None of the reactivity-improving materials recited in pending claim 73 are shown in the laundry list of thermal expansion-improving elements appearing on page 3 of EP '900. Similar to the above, nor has the PTO cited to any factual evidence in EP '900 that would motivate one to include any of the reactivity-improving materials recited in pending claim 73 in the metal alloy disclosed in EP '900. EP '900 fails to even mention the reactivity characteristics of the infiltrating metal. Consequently, EP '900 fails to disclose or suggest each and every element recited in pending claim 73.

As discussed above, pending independent claim 80 recites that a Cu or Ag metal is infiltrated into a carbon or graphite porous sintered member. The infiltrating metal includes an element added thereto for the purpose of improving the molten metal flow performance of the infiltrating metal. There is no disclosure or suggestion in EP '900 that any of the thermal expansion-improving elements appearing on page 3 of EP '900 improve molten metal flow performance of the infiltrating metal alloy, as claimed. Nor does EP '900 appear to be concerned with the molten metal flow performance of the infiltrating metal as evidenced by the complete lack of disclosure with respect to molten metal flow performance.

Consequently, EP '900 fails to disclose or suggest each and every element recited in pending claim 80. In the event that the PTO should maintain this rejection in a subsequent Office Action, the PTO is requested to specifically cite to the portions of EP '900 that provide factual evidence showing that the thermal expansion-improving elements appearing on page 3 of EP '900 necessarily improve molten metal flow performance of the infiltrating metal alloy, as claimed.

Furthermore, as explained above, pending claim 80 recites that at least one of Cu and Ag includes an additive to improve molten metal flow performance. Pending claim 80 also recites that the additive has a temperature range of solid phase/liquid phase of not less than 30 °C. Applicants respectfully submit that there is absolutely no disclosure or suggestion in EP '900 of a Cu or Ag alloy including an added metal that has a "temperature range of solid phase/liquid phase of not less than 30 °C," as claimed.

Nor does EP '900 even remotely suggest that such a molten metal flow performance enhancing element should be a CuSi or AgSi alloy, as recited in pending claim 81 (which depends directly from claim 80). For this reason, pending claim 81 is also allowable over EP '900.

As discussed above, pending claim 87 recites that a Cu, Al or Ag metal is infiltrated into a carbon or graphite porous sintered member. The infiltrating metal includes an element added thereto for lowering the melting point of the infiltrating metal. There is no disclosure or suggestion in EP '900 that any of the thermal expansion-improving elements appearing on page 3 of EP '900 lower the melting point of the infiltrating metal alloy, as claimed. EP '900 is completely devoid of disclosure relating to the melting point of the impregnated metal. Consequently, EP '900 fails to disclose or suggest each and every element recited in pending claim 87. In the event that the PTO should maintain this rejection in a subsequent Office Action, the PTO is requested to specifically cite to the portions of EP '900 that provide factual evidence showing that the thermal expansion-improving elements appearing on page 3 of EP '900 lower the melting point of the infiltrating metal alloy, as claimed.

As discussed above, pending independent claim 94 recites that a Cu, Al or Ag metal is infiltrated into a carbon or graphite porous sintered member. The infiltrating metal includes an element added thereto, which, in addition to improving the coefficient of thermal conductivity of the heat sink material, forms an alloy that is deposited on the surface of the infiltrating metal after a heat treatment and reaction with the carbon porous sintered member. The deposited alloy has an initial coefficient of thermal conductivity of not less than 100

W/mK. There is no disclosure or suggestion in EP '900 that any of the thermal expansion-improving elements appearing on page 3 of EP '900 improve the thermal conductivity of the heat sink material, as claimed. Moreover, there is no disclosure or suggestion in EP '900 of any metal alloy having an initial coefficient of thermal conductivity of not less than 100 W/mK, let alone such an alloy being deposited on a surface of the infiltrated metal. Consequently, EP '900 fails to disclose or suggest each and every element recited in pending claim 94. In the event that the PTO should maintain this rejection in a subsequent Office Action, the PTO is requested to specifically cite to the portions of EP '900 that provide factual evidence showing that the thermal expansion-improving elements appearing on page 3 of EP '900 improve the thermal conductivity properties of the infiltrating metal, as claimed.

As discussed above, pending claim 101 recites that a Cu, Al or Ag metal is infiltrated into a carbon or graphite porous sintered member to form a heat sink material. A carbide layer is formed on a surface of the carbon or graphite heat sink material. As is discussed in the specification (and recited in pending claim 102), the carbide layer is formed due to a reaction between the carbon or graphite porous sintered member and an element that is added to the infiltrating metal. There is no disclosure or suggestion in EP '900 that, due to the inclusion of any of the thermal expansion-improving elements appearing on page 3 of EP '900, a carbide layer is formed on a surface of the carbon material, as claimed.

Consequently, EP '900 fails to disclose or suggest each and every element recited in pending claim 101. In the event that the PTO should maintain this rejection in a subsequent Office Action, the PTO is requested to specifically cite to the portions of EP '900 that provide factual evidence showing that the addition to the infiltrating metal any of the thermal expansion-improving elements appearing on page 3 of EP '900 would necessarily yield a structure having a carbide layer formed on a carbon surface thereof, as claimed.

In view of all of the foregoing, reconsideration and withdrawal of the §102(b) rejection over EP 0673900 are respectfully requested.

3. Claim 88 was rejected under §103(a) over Maruyama or EP 0673900 in view of JP 10-168502. Applicants respectfully submit that the arguments submitted above distinguish claim 87 from Maruyama and EP '900. Since JP '502 does not overcome the deficiencies of Maruyama and EP '900, and since claim 88 depends directly from claim 87, that claim is also believed to be allowable over the applied prior art of record.

If Examiner Turner believes that contact with Applicants' attorney would be

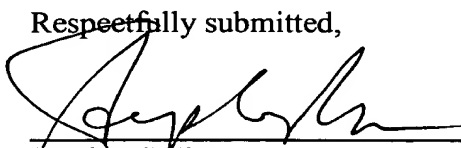
advantageous toward the disposition of this case, she is herein requested to call Applicants' attorney at the phone number noted below.

The Commissioner is hereby authorized to charge any additional fees associated with this communication or credit any overpayment to Deposit Account No. 50-1446.

Respectfully submitted,

November 18, 2003

Date



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